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A CHRISTMAS ADDRESS.

Science and the Elementary Schools,

DELIVERED AT A

GENERAL MEETING OF THE
TEACHERS

OF THE

Cleveland Public Schools,

BY

ANDREW S. DRAPER,
Superintendent of Instruction.

SATURDAY, DECEMBER 16th, 1893.

PUBLISHED BY

THE BOARD OF EDUCATION.



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A Christmas Address:

SCIENCE AND THE ELEMENTARY SCHOOLS.

THE SCHOOLS OF ANCIENT TIMES.

The modern, free elementary school has had a growth and extension which is phenomenal. It reaches out its kindly arms unceasingly and farther and farther to the world's children, and year by year it gains in strength and power and completeness. It is going to be the world's universal civic institution.

The ancients maintained schools more than we are accustomed to remember. In some cases they were more elaborate, reached higher and had wider range than we commonly recall. But they were for the purposes of the king, not for the uplifting of the people. The instances in which the purposes of the king coincided with the interests of the people are so rare that they hardly count. The kingly power under one name or another was everywhere present. It was supreme. Its foot was upon the neck of the people and it was inexorable. Its ambition was the perpetuation of the dynasty. Ignorance and superstition were its instruments to that end. Such schools as were set up were for the few as against the many, for favored classes who were trained

to augment the power of the king and forge the chains of the people. When the arts were cultivated it was that they might adorn the crown. Brute force was the power that controlled the race. The world sped on in darkness because the people were slaves.

LIGHT IN THE WORLD.

But light broke. It was heralded by a new star above the hills of Bethlehem. The world will never fail to commemorate that great event. In memory of it we suspend all our ordinary work ; we give ourselves up to mirth and gladness ; we give gifts and do what we can to make our friends merry and carry happiness to all who are about us. Upon this one anniversary, by common impulse, the world comes into harmonious accord ; all minds dwell upon one historic scene ; all feelings are in union ; all instruments of music are in one key ; all the people sing, and all the silvery bells ring out the *Te Deum* and the *Gloria in Excelsis* with a depth of feeling and expression unequalled at any other time "Through all the circle of the golden year."

It is the noblest way in which ~~we~~ could celebrate the greatest of religious anniversaries. But Christmas has a civic as well as a religious significance. If we were to observe it with oration, and booming cannon, and martial music, and marching column, it would not be as appropriate an observance, but it would not be an altogether inappropriate observance of the day, for the birth of the Savior was the most momentous event in civil as well as in religious history.

It brought a new force into human affairs which was destined to overturn kingdoms and bring the plans of kings to naught. It set up a King above kings,

whose mission was the uplifting of all mankind, whose plan was to be made known in the uttermost parts of the earth, for whose sake men and women were to go to the rack and the scaffold and the block, in whose cause vast armies were to fight and so prevail as to change the whole current of human affairs. The missionaries of the Cross, in the market places and in the wilderness, stirred the minds as well as the hearts of men. Persecution by the kings only intensified devotion. The blood of the martyrs became the seed of the church. Thought was set in motion. It was the plan of the Almighty, and it was irresistible. Then came the moving of the mighty hosts in the crusades for the reclamation of the Holy Sepulchre. They failed in their specific object, but they accomplished infinitely more. The tread of their armies reverberated throughout Europe, set the nations all in action, energized thought and opened the way for a new civilization. Again, it was in the plan of the Almighty, and it was irresistible.

THE DISCOVERY OF AMERICA.

In history events lead on to consequences with unerring and majestic tread. The movements of the nations led right on to the discovery of America, another mighty event in the marvelous plan for the uplifting of the people. It became a practical necessity to find a water route to the Indies. Reason told a great navigator that it could be found by sailing westward. Let it never be forgotten that Columbus sailed on the faith of an idea. He died in the confidence of success, but in a delusion, for Cathay was still many thousand miles away. But what a glorious delusion it was. If he had not reached the eastern shores of the *old* world, he had come

upon the eastern outposts of a *new* world, and next to the birth of Christ he had accomplished what was the most momentous event in human history if it is to be measured by its influence on the affairs of men.

RESULTS OF THE DISCOVERY.

The belief that the long-sought water route to the Indies had been discovered and that the products of the Empire of the Grand Kahn could be brought to Europe in ships, sent a thrill of new life throughout the land and gave a new energy to the thought of the people. Marked results followed, for life and thought will have expression. In the next twenty-five years Luther had nailed his ninety-five theses on the church doors at Wittemburg and fired the sunrise gun of the Reformation. The opening epoch was to be a bloody one, but it was to witness the birth of liberty. Nothing moves the people like religious feeling. Nothing ever did move the people like the feelings which had their expression in the Reformation. A new religious and intellectual development was everywhere apparent, but was most marked in Germany and in Britain.

It was more than half a century after the discovery of America before the fact became known that the land upon which the great navigator had come was not China, but a new and independent continent. This new discovery was not a disappointment. It made the achievement of Columbus of much greater consequence than had been thought. The possibilities of this new fact had no limit. In its turn it gave added activity to the life and thought of Europe. Spain, under whose patronage this great achievement had been accomplished, at once gained great importance and became the most ag-

gressive and warlike nation of the world. She had found a new world, and it impelled her to attempt the subjugation of the old one. Her government was, of course, the will of the king, and her policy was against liberty of thought and the independence of the people. She very naturally directed her power against the nations where development was most marked and intellectual emancipation was most promising. She pushed her armies into the Netherlands and set up the Inquisition that she might bring to her feet the most progressive people of Continental Europe; at the same time the granddaughter of Ferdinand and Isabella, one of the accidents upon the English throne, and the doting wife of the Spanish king who both controlled and hated her, —the weak and bloody Mary, began the horrible work of Spanishizing Britain with flame and fagot.

The world-wide battle of the people against the king was now on, and it was to continue to a finish. Moreover, a change in the program was at hand. Kings and queens, as well as subjects, were to lose their heads. There could be but one result. Thought is all powerful. The truth will work its way out. An overruling power was behind it all. William the Silent and the Netherland Republic, Cromwell and the English Commonwealth were inevitable. So were the American Revolution and the French Revolution and all the other struggles which have been waged and all the triumphs which have been gained for the liberty of the common people and for intellectual independence.

THE RISE OF COMMON SCHOOLS.

I surmise we should have difficulty in finding a task more fascinating than a closer study of these mighty

events and all the innumerable array of other events which cluster about them, and also of their relations to the conditions of our modern life, and particularly to the rise and growth of our civil institutions. And I surmise, moreover, that the more we study the more we will value the beneficent institutions under which we live and the more closely we shall see their relations to the great event we celebrate at Christmastide.

The life must be long, and the scholarship thorough, and the labor uninterrupted and assiduous if one person is, even measurably, to accomplish this great work. Men and women who do it but partially, though thoroughly, gain great prominence in the field of historic literature.

We may for the hour, however, take one of these institutions and consider a single phase of that. It is the institution with which teachers are most familiar ; it is a phase suggested by the Christmas season and is the natural sequence of the reflections in which we have already indulged.

No fact is clearer in history than that common schools followed upon the overthrow of the kings. In some lands the king was dead before the king knew it. In some lands he is dead for all practical purposes long before the people understand it. But in no land have free schools for all the people preceded the practical overthrow of the kingly power ; in no land have free schools been long deferred after the power of the king has been broken or has been surrendered, or has become obsolete by disuse. The extent and the character of the elementary free schools of a people measure, with considerable nicety, their preparation for civil liberty and the extent to which they possess and exercise it.

In Germany free elementary schools followed immediately the Reformation; in France they have had a most phenomenal and scientific growth since the overthrow of the third empire; in England they have followed upon the growth of that spirit of independent liberalism which is well represented in the progress of the Liberal party; in America they came first from the Dutch in the Old Netherlands with the Dutch at the mouth of the Hudson in the New Netherlands, then with the English in New England as those colonists came more and more to oppose the power of the king, and they spurted into being everywhere when independence was gained and self-government was completely established.

SCIENTIFIC PROGRESS IN THE SCHOOLS.

In all countries, and particularly so in this, the improvement of the schools has been gauged by the intellectual strength of the masses, and the power of the people to obtain that which they are able to see that they need. And in turn the schools have helped the masses in all lands where they have been established, but the extent and effectiveness of the schools has been in exact proportion to their advance along scientific lines.

WHAT IS SCIENCE?

What is science? Some of the old writers called it "God's sight," and the characterization was not at all inappropriate. Science is the truth of the Almighty overcoming obstacles, working its way out through difficulties and marching on to its final triumph. Science and nature and Deity are very nearly the same. They are in full and harmonious accord. They constitute a power which is everywhere present and always active. No

matter about any peculiarities of our personal beliefs, no matter in what kind of a church we worship, or, indeed, whether we worship at all, there is not one of us that does not realize the existence of such a Power in the world and does not know that it is everywhere present in the universe and that it is always active. We know that it controls both mind and matter; that flowers bloom and the electric current flows, and minds unfold, and planets revolve and keep to their courses under its laws.

Frequently we are unable to understand its processes. Names are cumbersome. The language of science is discouraging, for it seems unduly involved and unnecessarily mysterious. But learning and research are continually helping us. How much has been revealed to this generation which has been withheld from all that have gone before it! And as one difficulty after another is removed and one achievement after another is accomplished, how mysteries are explained, how remote facts come into relationship, how the harmonies of the universe are established and how we stand in the presence of the mighty Power that is behind it all!

That is sometimes called science which is not science. In reaching from the known into the unknown there is danger of letting go of the known and falling into the unfathomable unknown. There is intellectual dissipation for some in contentions which no one can establish and no one can overturn. True science holds on to what is known and keeps in touch with what is material. It is intensely practical. Its mission is not to involve in mystery, but to clear up the sight and unlock the truth.

HARMONY WITH SCIENTIFIC KNOWLEDGE.

We have lived long enough to know how vital it is to our happiness and our usefulness that we keep in accord with the Power that rules the universe, and that we act in harmony with scientific knowledge. We have, all of us, experimented enough to see how dangerous it is to attempt to cross the boundaries which nature sets against human action. We are surely experienced enough to understand both the fascination of scientific study and the vital relation of its results to the uplifting of the human race. Human laws, which merely regulate the social organization, must necessarily differ according to the circumstances and experiences of nations and change with their changing conditions, but the laws of nature are universal and unchangeable. The human life which measurably expands to its possibilities must read the book of nature and act upon its precepts. The life which does this is enriched, gains capacity for enjoyment here and will find itself in harmonious relations with whatever there may be in the hereafter.

SCIENCE IN THE SCHOOLS.

If this knowledge is of consequence to the individual so it is to the school. If it has lifted up the individual so it has the school. If it has brought a new light into the life of the individual so it has into the life of the school. If it is a stairway to the high ends of human existence, it is, of course, a vital element in the curriculum of the schools. Let us try to see what it has already done and how much more it may do for the schools.

THE SCIENTIFIC SCHOOL-HOUSE.

Science is evolving a scientific house for the use of

the schools. Science and art are both telling us things that our fathers never thought of. The one is showing us how cultivated taste and skill can make a building which will please the eye and train the aesthetic taste for the same money that was expended upon the unsightly structure of the last generation, and experience has shown that even the sense of the child is strong enough to respect and care for it if it is pleasing to the eye and is worthy of being cared for. Art has shown that no school authority can afford to ignore its entreaties. But science is more imperious. By consequences and results it has shown that no school authority dare disregard its injunctions, for its mission is to conserve the health of the pupils and promote the effectiveness of the school.

It concerns itself with the character of the ground upon which the building is to stand and the conditions with which it is to be surrounded. It locates the building with reference to the points of the compass and the advantages of sun-light. It discriminates in material; it puts the basement floor above the water line; it regulates the height of stairs; it asks for sheltering porches and demands that outer doors shall swing outward. Above all, it looks to the size, and shape, and temperature, and ventilation, and lighting of rooms. It says that the good health of each child requires at least twenty square feet of floor space and two hundred and forty cubic feet of air space; that fresh air, right from the outside, is even more important than warm air, and that every child must have at least two thousand cubic feet of it per hour, if the necessity of re-breathing the same air and the consequent likelihood of disease is to be avoided. Science prescribes the methods for getting warm and fresh air

into the room and for taking dead air and foul gases out of the room, and provides the instruments for determining the extent to which it is accomplished. Science looks to the tinting of the walls and takes light from the ceiling or the left side for the purpose of protecting the eyesight of pupils. Thus sanitation, hygiene, and also seats, blackboards and innumerable other points receive scientific attention; these serve to indicate the extent to which knowledge is evolving a healthful and pleasurable school room. Of course, the perfect building has not yet come, and the schools have many old buildings on their hands which they have inherited, and some people are slow to see the value of scientific knowledge, but when we compare the new school-house with the old one and know that no intelligent parent will longer be indifferent, and no intelligent official dare be indifferent to these things, we see with what rapid strides the light and truth have been advancing.

THE SCIENTIFIC TEACHER.

If science has been potent in the improvement of the school-house so it has surely been in the preparation of the teacher. Fifty years is a brief period in the history of education, but the last fifty years constitute a period which will be memorable, for that period has witnessed the rapid and mature development of the science of teaching, and that development has worked a complete revolution in the conduct of the schools. Our fathers were accustomed to think that any one who knew a thing could teach it. They were far from the truth. Investigation and experience has shown the truth to be that the bare possession of knowledge is but one element in the equipment of a teacher. He must know

human nature; he must understand the particular mind to be taught and be able to come into harmonious relations with it; he must engage its attention, arouse its enthusiasm, and make it not only receptive of knowledge but eager for knowledge before it can gain knowledge which will give it strength. A mere imitator cannot do this; much less can one who knows nothing of scientific processes and is not even an imitator. Pestalozzi declared that "Education is the generation of power." The elements of power must exist for the generation of power. The teacher must understand principles and be able to employ the best methods at the right time and in the right way, with a trained and discriminating judgment. The force of these scientific facts has but recently come to be apparent. When New York first, and Massachusetts a little later, commenced to train teachers for the common schools some fifty years ago, it would be supposed that it was pursuant to these scientific truths; but quite the contrary is the fact. There was even then no recognition of them whatever. But the light broke at last. To-day there is no movement in progress which is more rapid and forceful than that towards the professional preparation of the teacher. It is true that the general public scarcely understand it yet. But the teachers do. The entire army of teachers is under its influence and on the advance. The ones who do not catch the spirit will have to go upon the retired list without a pension. The new recruits will have to meet larger exactions. The whole force is moving to a higher, because a more scientific, position. The world will not long fail to respect expert knowledge and it will not fail to honor artistic work.

SCIENTIFIC STUDY OF CHILD-LIFE.

Very recent years have witnessed the rise of a new study—the scientific study of child-life. The World's Educational Congresses of the Columbian Exposition afforded the opportunity of organizing a national society for securing to this end the co-operative efforts of physicians, ethnologists, anthropologists, psychologists, parents and teachers, all who are interested in children and who have regard for scientific truth. The work has been divided for convenience into four classes: First, the embryo; second, infancy; third, school life; fourth, youth to maturity. The field is a broad and fruitful one. Teachers should be ruminating in that part of it relating to school life. Considerable progress has already been made. Measurements of the bodies of 25,000 children in Boston, of 10,000 in Milwaukee, of 30,000 in St. Louis, and of many other thousands in other cities have been taken, and from these measurements many interesting physiological facts have been deduced. For instance, it was found that until the age of eleven or twelve boys are taller and heavier than girls, then girls begin to grow rapidly and for the next few years surpass boys both in height and weight, then again the boys overtake them and remain taller and heavier ever after. Rural life produces larger bodies than urban life. Children of American born parents average larger than those of foreign born parents. It seems to be the fact that there are three distinct periods of growth, viz.: a moderate increase in the sixth and seventh years, a weaker growth from the ninth to the thirteenth years, and a much greater one from the fourteenth to the sixteenth years. The fact seemed to appear that children grow little from the end of November to the end of

March, and much between August and November. The fact seems also to develop that growth focuses first upon one set of organs and functions and then upon another. The head, eye, hand, arm, chest, voice, have periods of decided development, which are not coincident in the same person. All this calls for corresponding recognition in making up the curriculum and determining the policy of the school. But this is only one phase of the subject. It extends to muscular control, and the nervous system, to the hearing and the sight, and to all the organs and functions of the body.

It extends also to the study of the mind and to conditions and influences which affect the opening and growth of the same. We are too prone to forget how many things which are very common to us are sealed to others and how things which they understand perfectly are a mystery to us. Surely one half of the world does not know how the other half lives. In 1880, Dr. G. Stanley Hall, the accomplished president of Clark University, studied a large number of children who had just entered the beginners' grade of the Boston schools. His scientific intelligence is established and the reliability of his statements cannot be doubted. He says that fourteen per cent. of these six-year-olds had no idea of the stars, thirty-five per cent. had never been in the country, twenty per cent. did not know that milk came from cows, fifty-five per cent. did not know that wood came from trees, thirteen to fifteen per cent. did not know the colors, green, blue and yellow, by name, and three-fourths of all had never seen any of the common cereals or vegetables growing. Other children would know all about these things but would be ignorant of matters with which these children would be

familiar. All this emphasizes the importance of the proper treatment and suggests methods for meeting the conditions which are presented.

But this is not all. The span of the memory, the influence of the imagination, the force of reason—all of the processes of the child-mind; the trend of the feelings, the strength of the attachments—all the natural likes and dislikes of children, have been studied with scientific care in order to know how to make the work of the schools most prolific of good.

Of course, this thing may be overdone. There is great possibility of error. Facts may be apparent rather than real. Deductions may be lame. Logic may be spread out until it is thin. There is a rich field for ridicule. That has been the common lot of science in all lands and all ages. Still science is conquering the world. The truth keeps working its way out and marching on. It is doing so with majestic step in this case. The scientific study of the child and the scientific training of the teacher have already revolutionized the work of the schools to such an extent that a plain statement of what the new schools are doing is regarded by the last generation with disbelief or incredulity, and a plain statement of what the old schools did is felt by the new generation to be false or unfairly exaggerated.

MANAGEMENT OF CHILDREN.

As the physicians of the past generations gave physics and emetics and put on leeches and let blood indiscriminately, thus breaking down the constitutions they were employed to build up, so the teachers of past generations fumed and scolded, and strutted, and thrashed, and so humiliated the characters they were

employed to uplift. Occasionally there was a physician and occasionally there was a teacher with a clearer vision than the rest; occasionally there was a patient with a constitution which was bound to outwit the doctor, and occasionally there was a character bound to outlive the absurd discipline of the school.

That discipline was almost uniformly harsh. The government was not one of reason but of force. The teacher, if a woman, was employed in the summer time to teach the girls because she was related to the trustee, or his cousins, or his aunts; and if a man, was employed to teach the boys in the winter, because he had superior strength, agility and courage. The threatening talk and the menacing conduct of the teacher stirred up all the risibilities and combativeness of human nature. The teacher was thought great by the people if he could conquer the school after stirring its passions. A substantial ferule was always in sight. Frequently a rawhide whip was kept in the room. Many carried a rattan in the hand continually. Flagellations were of every day occurrence. Frequently they were cruel in the extreme. Struggles and blows and outcries which no intelligent parent of our day would permit his child to witness, and from which he would either turn himself or which he would stop by force, were very ordinary. The ingenuity of the teacher was taxed to find methods and instruments of punishment. Children were made to hold weights at arm's length, to "sit on nothing" with the back against the wall and the feet at leg-length therefrom, or to do anything which would be excruciating, humiliating and degrading. If they flinched they were whipped for it. To make the thing especially obnoxious boys were sometimes sent out to get whips with which

to be whipped; and sometimes boys who were not involved in trouble were sent for whips with which to whip their brothers or associates, in order to make the affair particularly unbearable. These things seem impossible or gross exaggerations, but there is no one of them which, without pleading to very advanced age, I do not personally remember.

Of course, children had spirit then as now, and that spirit resented and organized to resist this stupid brutality. Teachers were frequently put out of the school house. Life and death struggles between the school and the teacher were common, Mr. George H. Martin, who would certainly make no unguarded statement against the divine attributes of the people of Massachusetts, says in his recent history of the school system of that State, that during one winter more than three hundred schools were broken up in Massachusetts by the insubordination of pupils. The common proceeding was to put the teacher out of the school-house. The old pedagogue who has survived is inclined to boast of the fact that he stayed in the school-house at all; it is the tallest feather in his plume.

At home the child was asked not what he did in school during the day, but whether he was whipped. This, with "chores" morning and afternoon, with the dearth of games and of books, and with brimstone theology, in allopathic doses, nights and Sundays and between times, made an environment which was not well calculated to ennoble the nature of the child, as it certainly was not likely to promote cheerfulness in his meditations. If substantial character afterward developed, as it very frequently did, the fact was due to other circumstances and considerations which have very largely

ceased to exist. If strong manhood followed it was not because of this harsh and senseless disciplinary treatment, but in spite of it.

Fortunately it has all passed away, for scientific study of the secret springs of human motives and actions showed, and experience proved, that such a plan of management rested upon a basis which was wholly fallacious, that the more force there was the more there would have to be, that it degraded the teacher, that it set up a standard of excellence in the minds of the people which was utterly false, and was a bar to the fruitfulness and effectiveness of the teacher's work. It brutalized the school and absorbed the productive energies of the instructor. It put the child out of teachable relations with the teacher, and scientific thought would not have it so. It was against nature; it was opposed to the truth, and it is among the eternal verities that nature and truth shall have their way. And they have been having their way, for in the person of a teacher more intelligent and better prepared, they have appealed to the reason, the affections, the ambitions, the honor; they have made study both objective and attractive; they have given the opening mind the pleasure of learning things and accomplishing things; they have helped and inspired and trusted, until they have brought pupils into relations which make *teaching* practicable and into an atmosphere where teaching must be a thing of energy and power.

SCIENTIFIC TEACHING.

If science has done much to improve the environment and the management of the school it has done more to improve the instruction.

The old theory, if there was a theory, seems to have been that children came into the world totally depraved and terribly wicked. They must not be allowed to do things they liked to do for their ways were evil. They must not be permitted to follow the leadings of nature for fear they would get in the habit of having their own way and be spoiled. The way which was the longest, and the hardest, and the most unnatural, was the way which had the most discipline in it, and was therefore best calculated to subjugate them in this world and educate them for the world that is to come. Indeed, that seems to have been the aim of the old schools and the earlier plan of education.

The new education proceeds upon an entirely different theory. It starts with throwing the total depravity hallucination to the dogs. With Bryant it sings:

“Innocent child and snow-white flower
Well are ye paired in your opening hour,
Thus *should* the pure and the lovely meet,
Stainless with stainless, and sweet with sweet.”

It keeps company with nature. It studies to learn what the truths of nature are. It gains the support of nature. It tries to assist nature. It keeps in sympathy with the real. It sees that it cannot contravene the laws of the Universe, and it seeks first to understand and then obey them and make the most of them. It tries to make the child at home in the school room. It utilizes his natural tastes and desires and fancies for his improvement. From the Kindergarten to the University the instruction is alive, objective and natural. The Almighty has implanted in every human being admiration for the beautiful. A child delights in a flower before it knows why. Scientific teaching makes the most of that fact in

an infinite variety of ways. There is no fun in learning rules. Some children cannot do it at all. But all children like to *do* things and to show their handiwork. Scientific teaching does not try to overcome that fact, but seizes upon it and applies it to its own purposes in innumerable ways. When nature is allowed to have its way all children have real satisfaction in finding out facts and like to lead on from one accomplishment to another. These facts are the basis of the new plans of the schools.

Methods have been thoroughly reformed on a scientific basis. The old plan commenced with the alphabet and the book. It is difficult to make people who are past middle life and not associated with the schools believe that children can be taught to read without first learning the letters. Yet what a slow, tedious, wearing process it was! The new plan commences without either the alphabet or the book. It takes the child before he can be taught to read, and the school becomes a joy and a fascination to him. While it gets possession of him and gains his confidence by methods and objects which his nature cannot resist, it exercises his muscles, sharpens his observing and perceptive faculties, and starts the habits of inquiry and investigation; it arouses his emotions and directs his affections; it quickens his eye and trains his hand; it develops his reason and stimulates his moral sense. At the very beginning it lays the foundation of a broad character and establishes habits which make intellectual versatility and power.

And so it proceeds, upon a harmonious and consistent theory, with all the subsequent work of the schools. With processes and methods which are scientific and will not let the interest flag, because true to

nature and to life, it leads on through the primary school, and the grammar school, and the high school, and the college, and the university.

The old essential branches are taught in new ways. The child learns to read objectively. He learns to know words and sentences at sight, as he learns to know things at sight. He learns numbers not by words but by objects, and arithmetic not by rule but by demonstration. Geography is taught objectively and by real or imaginary journeys, and history by living in the past and moving with the scenes as they transpired. The whole plan considers the nature of the child and uses real things or fictions which are true to nature to accomplish its purpose.

The Manual Training which has come into the schools in these recent years and is being co-ordinated with all the other work, from the beginning to the end of the course, is practical and adapted to the new circumstances of our active life, but it is no less scientific than practical. Indeed, if it were not scientific it would not be practical. The men and women who developed the material resources of the land, who built up the institutions of the Republic had their childhood in an age which *did* things. Many of the boys were country boys, who cut wood, and broke steers, and mended harness, and made their own sleds; others who lived in the cities came from homes where poverty was the inspiration of industry and ingenuity, and they came by the way of a factory or a shop. The girls learned the household arts at their mothers' side and contributed their share toward the family living. In either case they were in contact with things and were where they had to use their hands. It was more of a privilege than they then thought, for it contained the

elements of intellectual growth and of sturdy manhood and womanhood even more than of manual dexterity. These privileges are largely denied the youth of our day, and scientific thought has discerned this deficiency and reasoned what the consequences would be. It has remedied the loss in a way which brings new interest into the schools and strengthens all the other lines of their work.

Further investigation would bring out many other and perhaps more important facts in proof of the scientific improvement of the schools, but even this superficial and imperfect examination shows how through all the discussion and the experimentation of these recent years the truth has been making its way to the surface and the schools have been settling down gradually and surely to systematic lines of work which are in harmony with the laws of nature, and therefore lead on directly and irresistibly to the higher ends of human existence. Of course, we are not yet at the sun-rise of the Millenium morning. But we are making headway in that direction. We surely find clearer foresight, a more consistent theory and greater definiteness of purpose in the schools. They are fitting for this life, and that is a good step on the road towards preparation for the life that is to come. They aim at intellectual versatility, at productive power, at discriminating judgment, at substantial character and sound citizenship. They can hardly be charged with more. Their plans show greater maturity and more uniformity and solidity. All is not chaos. An educational *system* is being evolved.

Some things have become settled and established in the organization and the work of the schools. No careful observer of the Educational exhibit at the Columbian Exposition could fail to note how all the progressive

educational work of the world was settling down upon a basis of scientific truth, and no reflective observer could fail to think how much farther this movement had gone in the universe of thought which could not be illustrated in a material exhibit than in the world of things which could be so presented.

THE STUDY OF THE SCIENCES.

It remains to be said that the schools have not only been molded and directed by scientific thought in these later years to an unprecedented degree, but the schools—the common schools, the elementary schools—are commencing the direct study of the sciences as never before. It is not so very long ago since this kind of study was monopolized by a few students who led a secluded life and acquired a world-wide renown. It was surrounded by mystery. It dazed the incredulous and stirred the superstitious. But the truth was bound to expand. It came into the colleges and then into the secondary schools. No one thought of its going farther. But it was bound to march on. It has come into the elementary schools. In Cleveland it has this year been introduced into the regular course of the grammar grades. A little equipment of scientific apparatus and appliances—scales and measures, glass tubing and acids, lenses and mirrors, magnets and iron filings, flasks and spirit lamps—have been supplied, at inconsiderable cost, to every building.* The equipment is not extravagant, and there is no occasion for it being so. The beginning is

*The Course of Study and Assignment of Work prepared in the summer of 1893, for the guidance of the Cleveland Schools during the ensuing year, abridged, not the fundamental principles and processes, but the details of the Arithmetic work, enlarged upon the Nature Studies in all the grades and introduced the simpler Physical Sciences into the grammar grades. Even before that a light line of History had been commenced in the third and fourth grades, and it was then continued through the fifth and sixth

small, and there is no idea of enlarging it out of advisable proportions. But the work is fascinating and brings new interest into the schools. It promises all that the Association of New England Colleges, under the lead of the President of Harvard, claimed for it when they moved in advocacy of the plan.

The present age is a material and scientific one. It is unlike any which has preceded it. It did not come by conquest. It broke upon us as quietly as the dawn of a summer morning. It has witnessed a new love for nature and an added interest in her wonderful secrets and processes. It is an age of searching inquiry and close discussion. The false and the sham will be revealed; that which cannot stand discussion will go to the wall; the truth will work its way out. It is not only an age of demolition but one of accomplishment. It is an age of material development, for it is an age of constructive genius. It is an age of intellectual energy, for it is an age of disciplined thought. It is essentially an age of scientific knowledge and scientific power.

Science is the interpretation of Nature. But nature is manifest in the butterfly, the squirrel and the robin, as well as in the mammoths of the deep or the mastodons of the ancients; it is in the opening blade and the blooming flower as well as in the burning mountain and

grades, this study having been in the past a part of the seventh and eighth grade work only. The Geography work had already been put upon lines which lead into the fields of the separate sciences, but it was carefully revised and enlarged in the same direction. Phases of Manual Training were also introduced into all the elementary grades. The best English literature had been previously used to some extent in the seventh and eighth grades as supplementary reading matter. With the revision of the Assignment the work was enriched and carried back so as to commence with the fourth grade and reach forward and meet the same work in the seventh. Thus nearly or quite all of the leading recommendations of the Committee of One Hundred of the National Educational Association, so far as the work of that Committee referred to the curriculum of the elementary schools, had been anticipated, but the complete and authoritative endorsement of the changes made in Cleveland which comes in the report of the Committee of One Hundred is very gratifying.

the blinding storm; it is in the rocks and shells as well as in the invisible current which drives the machinery of our factories or that other invisible force which propels the machinery of our lives. There is science for the child as well as science for the savant. The activity of the child and the wisdom of the scholar each have their uses in unfolding the secrets of science.

“We have a secret, just we three,
The robin and I and the sweet cherry tree,
The bird told the tree, and the tree told me,
And nobody knows it but just us three.”

There is joy and fascination in nature, for the nature that is about us is in harmony with the nature that is within us.

“There’s a blush on the fruit and a smile on the flower
And a laugh on the brook as it runs to the sea.”

There is moral power in science. Who can see a dozen magnetized needles, floating on corks in a basin of water, repel each other and range themselves at equal distances apart and remain in exact equilibrium so long as the similar poles are all pointing up or down and then see the disturbance and the clashing which ensues when one of them is reversed, without thinking of what is behind all this? Who can see the earth turn under the swinging pendulum without knowing that this did not come by accident or chance, and without revering the Power which controls this motion and holds the spheres upon their courses?

There is intellectual awakening in the study of science. No one can engage in it without acquiring the habit of inquiry and investigation; no one can be under its spell without thought which is original; and these are the principal instrumentalities of the new education.

Scientific investigation, above almost any other work that can be taken up in the school room, is promotive of cordial relations between teacher and pupil. They work together for a common end—and that end is the truth. They are in harmony with a common object, and therefore in harmony with each other. The tension is removed, the problem of management is reduced in its proportions if not entirely eliminated, and teachable relations are established between teacher and child, and enthusiasm carries them on. Then we begin to realize how much more may be accomplished when instructor and pupil help each other, than when indifference prevails, or when they wear each others' lives with bitterness, or mechanically observe only the requirements of an armed truce.

Then the study of the simpler sciences, experimentally and in the methods of the laboratory, is both practicable and essential at an early age, and will promote the work of the schools both directly and by reflex and stimulating influence on the school organization, on the betterment of the building, on the growth of the teacher, on the temperament of the pupils, and on all the lines of work in which the schools engage.

THE SCHOOLS AND THE PEOPLE.

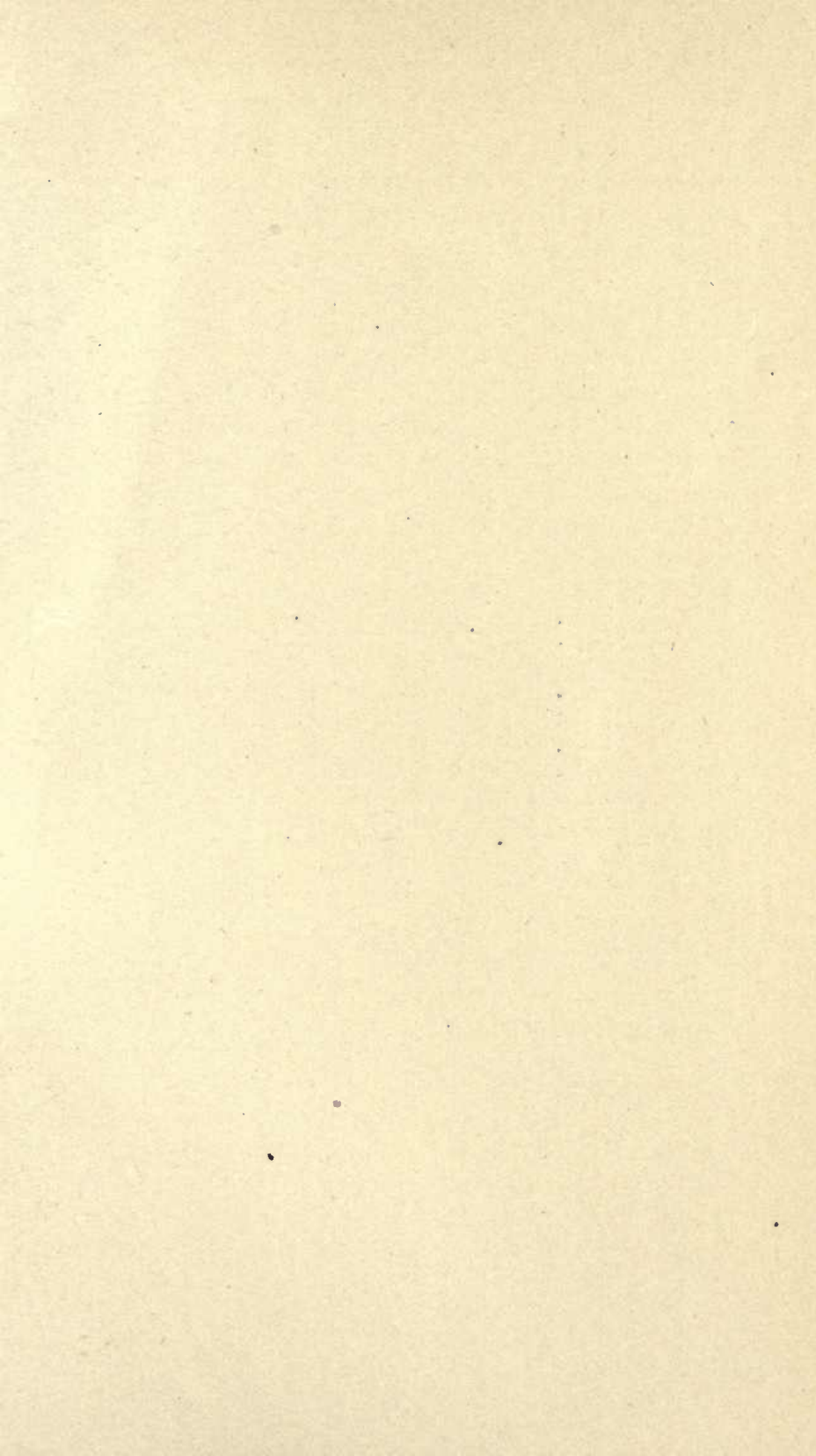
The schools must be kept in touch with the life of the people. That life is broader than it used to be. It is greater in volume and the current is swifter than in the days of our fathers. Interests and employments have multiplied many fold. Methods have changed. Energy has intensified. Intelligence has broadened marvelously. Aesthetic taste has grown. The life of the people has followed the leadings of nature. Nature is not depraved.

It does not lead the great mass the wrong way. This may not be wholly within the limits of old-time theological dogma; then dogma may have to suffer some amendments. It is easier to change what men have written than to turn the mighty current of human life from its channel. In any event, the life of the world has been liberalized. The truth is being liberated. Eighteenth century schools will not fit twentieth century life. The mathematical drill alone of the old schools will not suffice for the new. Training which answered for the narrow life of the past would be wholly inadequate for the swelling life of the present and the future. The schools must train for intellectual alertness. The schools cannot specialize. They may incidentally train artists, they may incidentally train mechanics, they may incidentally train engineers and diplomats; they must *surely* train thinkers. They must train all the children of the people so that, within personal circumstances and inclinations, all will have an equal chance. As the mass will not remain through the whole course, because their labor is necessary for bread, as the more a child is trained the better he can think and do and take care of himself, the schools must put the most care upon the work of the first years. From the first year to the last, the work must rest upon a scientific basis and be in the hands of artists if they can be procured or developed. It must be of a nature and it must employ methods which will germinate intellectual versatility and power. In healthful co-operation with the church and the home, the school must train for manly and womanly character and independence. Then as the river gains strength and impetus and majesty from tributary streams as it runs to the sea, so will the mighty current of human life

be enriched and energized by the work of the schools as it runs on to that final destiny where life and nature and the truth will be in entire harmony and accord.

CONCLUSION.

Three hundred and sixty-five thousand teachers instruct fourteen millions of children in the Public Schools of the United States. There are many other thousands in the schools of the other constitutional governments of the world. The elementary free school is indeed becoming universal and the teaching fraternity world-wide. No army in the world holds greater power in its hand. Upon no other does so much depend. If this great fraternity will think upon the movements of the dead centuries toward a higher life; if it will keep in sympathy with nature; if it will seek a clearer understanding of the leadings of the overruling power in the world; if it will have a larger interest in scientific study; then, it will have a deeper reverence for scientific truth; it will realize the assurance of Coleridge that "as we strive to ascend we will ascend in the striving;" it will see an unwonted meaning in the words of a greater than Coleridge who said, "And ye shall know the truth and the truth shall make you free;" and it will have added power in the schools as it will have added joy in the time-honored recurrences of the Christmas season.







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